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The Irish Plumber and Heating Contractor, July 1961 (complete issue)

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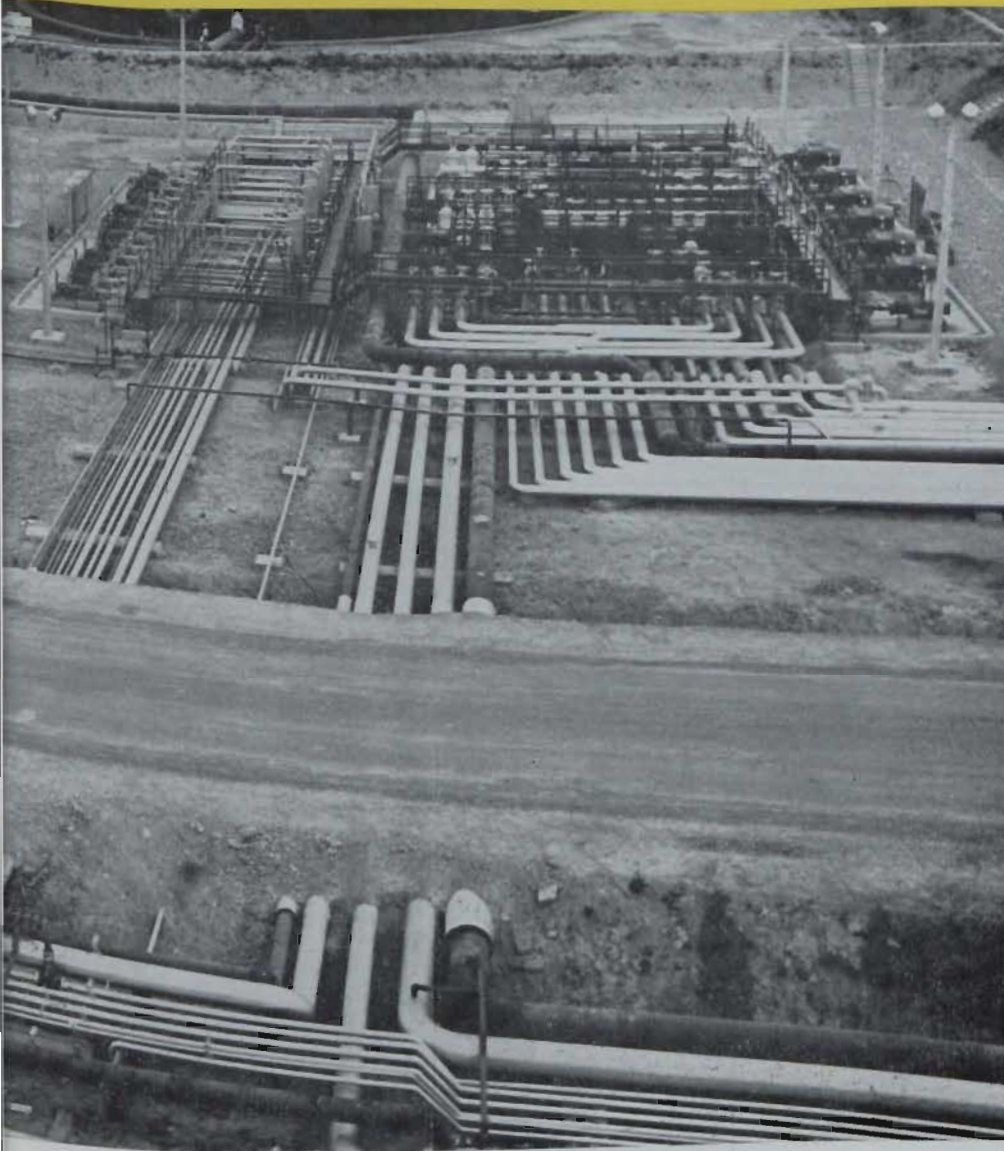
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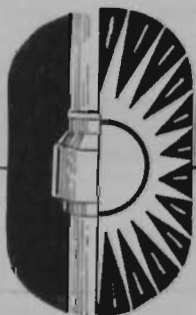
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JULY, 1961.



THE IRISH PLUMBER & HEATING CONTRACTOR

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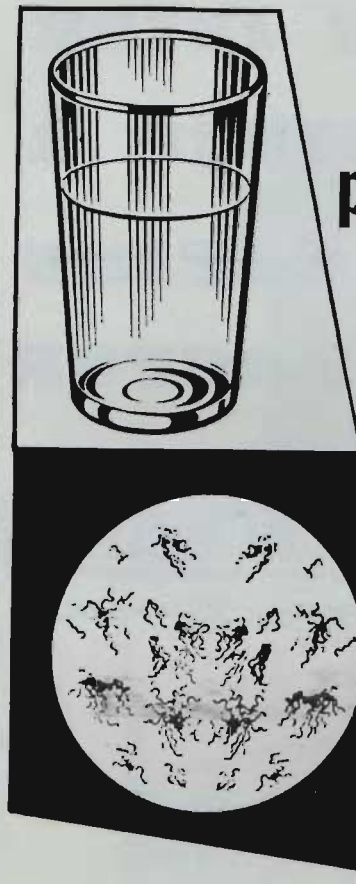
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We regret that, for reasons beyond our control, we were unable this month to present the third part of our series, 'Plastics in Plumbing', by Mr. D. C. Coyle, M.E., M.I.C.E.I., M.I.P.H.E., A.M.I.C.E., A.M.I.W.E. We hope to resume the series next month.—Ed.

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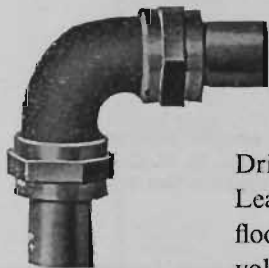
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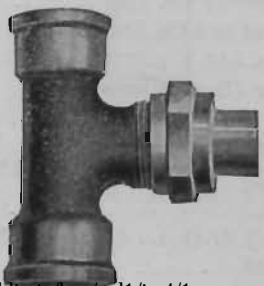


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water softening systems

et al.: The Irish Plumber and Heating Contractor, July 1961 (complete iss



the author ...

JOHN G. BOLTON, Lecturer in Plumbing and Heating at the College of Technology, Bolton Street, Dublin.

ALL water systems depend on rainfall as a primary source of supply, but rain, in sinking through the earth, may undergo many changes which later necessitates different systems and techniques to deal with it.

In its natural state, rain is soft, and in rural areas very clean. In cities and populated areas, on the other hand, it may absorb soot and sulphur in its passage through the air which could cause impurities, although this would not alter its original softness.

In general it is only when it percolates through the ground that difficulties arise. In this country, the water will, in all probability, become hard, due to its coming in contact with the limestone strata which extends over the greater part of the Irish terrain.

To the average person, a water will appear as hard or soft according to its action on soap. The harder the water the more difficult it is to produce a lather when washing. In fact, it is by its action on soap that the degree of hardness is determined scientifically.

What is not generally appreciated, however, is the fact that hard water can again be sub-divided into two types—permanent hard and temporary hard.

The permanent hardness results from the rainwater having absorbed sulphates of calcium and magnesium and perhaps also chlorides and nitrates, during its progress through the limestone, whereas temporary hardness results from the absorption of carbonates of calcium and magnesium.

From the plumbing point of view, the main difference, however, lies in the fact that permanent hardness in water cannot be removed by boiling, whereas the temporary hardness can. Even bringing this water to near boiling point will cause the lime to begin to precipitate—hence, the origin of all our troubles in rural areas with choked boilers and pipes.

In general, people prefer a soft water as it is more pleasant and efficient for ablutionary and domestic purposes, and in the case of hot water systems it does not cause difficulties with scale formation.

There are two methods of dealing with this problem. One is to soften the cold water as it enters the building, thereby giving soft water in both the cold and hot water systems. The other method is to deal with the hot water only, by the installation of an indirect system so as to prevent lime being deposited in the boiler and pipes. We are, however, only concerned with the first method in this article.

Classification of water

BEFORE going into the principles of water softening, it is first necessary to know how a water is classified as to its degree of hardness. In this country it is commonly based on what is known as the Clark Scale, each degree of which indicates one grain of lime per gallon (the grain being a measure of weight). This is equivalent to 1 part in 70,000 parts. For analytical purposes, it is recommended, since 1949, that all waters be classified in parts per million so as to conform to American and English practice.

Using the Clark system, water is normally classified as follows:—

TYPE	Degrees of Hardness, Clark Scale.	Parts per Million.
Soft Water	0 to 3.5 Degrees.	0 to 50 parts.
Moderately Soft Water ..	3.5 to 7.0 ..	50 to 100 ..
Slightly Hard Water ..	7.0 to 10.5 ..	100 to 150 ..
Moderately Hard Water ..	10.5 to 14.0 ..	150 to 200 ..
Hard Water	14.0 to 21.0 ..	200 to 300 ..
Very Hard Water ..	Over 21 ..	Over 300 ..

This means that any water containing 7 or more grains of lime per gallon would be classed as a hard water, hence, outside our cities and larger towns where the provision of soft water is a municipal function, it devolves on the householder as to the choice of a softening system.

The first real attempt at water softening dates from 1841, when a method known as the "cold lime" process was patented by Dr. Thomas Clark of Aberdeen University. The Clark Scale previously mentioned owes its origin to his research work. A variation of this process, known as the "soda lime" method, is used to some extent at present for industrial purposes.

Base-exchange system

FOR domestic purposes, the most satisfactory system is that known as the base-exchange or ion-exchange method—a process first discovered by a German chemist, Robert Gans, in 1905.

He found that certain natural greensands, rich in glauconite, and known as zeolite, could be used to soften hard water, both temporary and permanent—in fact, it was noticed that this sometimes happened where underground springs, etc., came in

continued overleaf

from previous page
contact with zeolite beds and so were softened naturally.

The action which takes place in this base or ion-exchange process consists in forcing the hard water with its dissolved calcium and magnesium through a container filled with zeolite, whereupon a chemical reaction is set up in which the calcium and magnesium salts passed or were "exchanged" into the zeolite, which in turn gives up its sodium into the water.

In brief, the hardness-forming salts are removed from the water and are replaced by sodium, which does not cause hardness and is not harmful in any way. The water then becomes "zero-soft."

In this exchange, however, the zeolite, having lost its sodium, becomes converted into calcium zeolite, and so is no longer able to soften the incoming water and must therefore be regenerated back to its original state.

This is simply done by putting into the softening container common salt (sodium chloride), and forcing it through by water pressure, whereupon the zeolite regains its softening property, and the calcium chloride or lime which was in it is washed out of the softener by running some of the incoming water to waste. For an average water of about 15 degrees roughly 1½ lbs. of salt is required per 100 gallons.

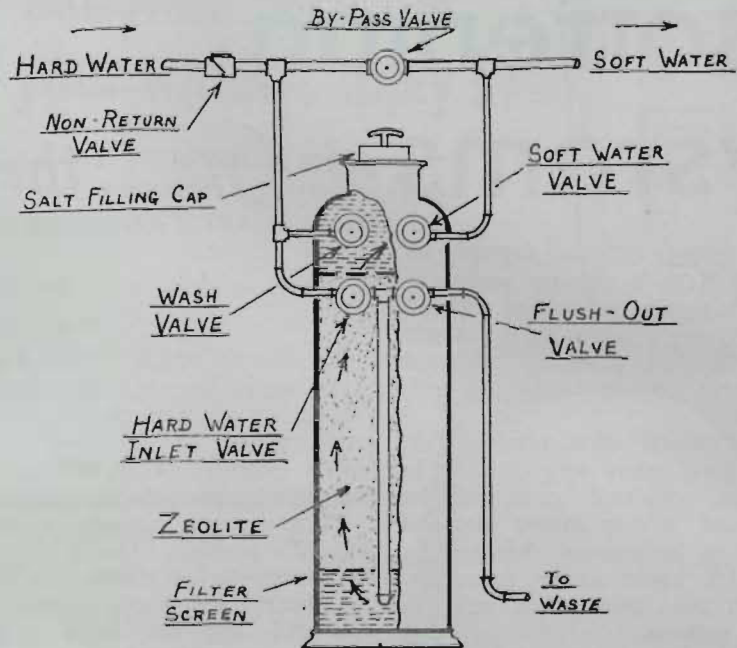
This softening and regeneration process can be repeated indefinitely without loss of the softening power provided the zeolite is not washed out of the plant.

In modern base-exchange plants, the natural zeolite media is often replaced by synthetic zeolite which is much better as it allows a larger quantity of water to pass through before it needs regeneration.

In general, the smaller the grains of zeolite, the longer will the plant work before salt has to be added—a point is reached, however, where very small grains might be washed out during regeneration and so a limit is set as to minimum grain sizes.

Selection of softener

WHEN selecting a base-exchange plant, several points must be borne in mind. Most softeners are rated as to the number of gallons of water at 16 degrees (Clark) they will pass through before needing regenera-



BASE-EXCHANGE SOFTENER

tion—for instance, a softener rated for 1,000 gallons at 16 degrees hardness would, of course, only soften 500 gallons if the water was at 32 degrees hardness and pro-rata. It is obvious then that some idea of the hardness of the water to be softened is necessary before selecting a suitable plant. Plant manufacturers are very helpful if approached on this aspect.

Next, a decision must be made as to how soft we require the treated water—zero softness can be obtained, but if a water of 3 or 4 degrees of hardness is allowable, and this is normal, a longer period between regeneration will result.

Again, another point to be noted is this period between regeneration—as each person uses about 30 gallons per day—a plant should be selected based on the number of persons in the dwelling, and a regeneration period of at least a week. Plants can be obtained for domestic use from 100 gallons to about 3,000 gallons, and in price from about £20 to £200 or more.

Two main types

THERE are two main types of softeners on the market,—the

popular "dry" salt design, in which the salt, in powder form, is placed in the container and later washed through, and the "wet" design in which the salt is converted into brine solution and placed in a special container connected to the softener.

This latter type simplifies maintenance as the container holds sufficient brine for several regenerations, and also, due to its being in solution, is a more effective medium.

More elaborate models can also be obtained, some even being controlled by an electric motor which automatically causes regeneration by opening a valve after a pre-determined quantity of water has passed through.

There are many designs of softeners available, among them the Permutit, Aqualux, Berkfield, Economic, each differing somewhat in specification but not in working principle.

With regard to its installation, it should be fitted in a convenient spot to enable salt to be added, and adjustments made to the valves. Models can be obtained to fit under the sink draining board.

It should be as close as possible to the incoming supply so as to sim-

continued next column

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THE first international Heating, Ventilating and Air Conditioning Exhibition at Olympia, London, from next September 26 until October 6, will be the greatest ever display in Europe from this rapidly expanding industry, and visitors will be able to examine all the latest products of the industry.

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Conference

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- * Administrative advances likely in the next ten years.
- * Technical advances likely in the next ten years.
- * Integrated design of architectural and engineering services for economy of building construction.

from previous page

plify connections, a non-return valve being sometimes fitted (as on drawing) to prevent back-siphonage into the water main or well, which might occur under certain circumstances.

In conclusion, it is important not to confuse water softeners with scale reducers. These are simply chemical or electrical appliances which are fitted in the cold water system or submerged in the cold water store-tank, the idea being to convert the hardness salts into a sludge which can later be removed by flushing out.

They have certain advantages when properly used, but are not intended to take the place of a water softener which will provide a supply of pure soft water without any deposit.

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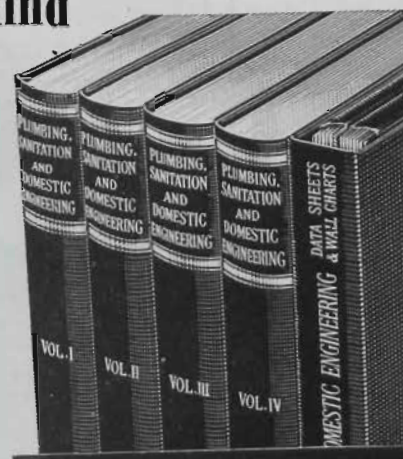
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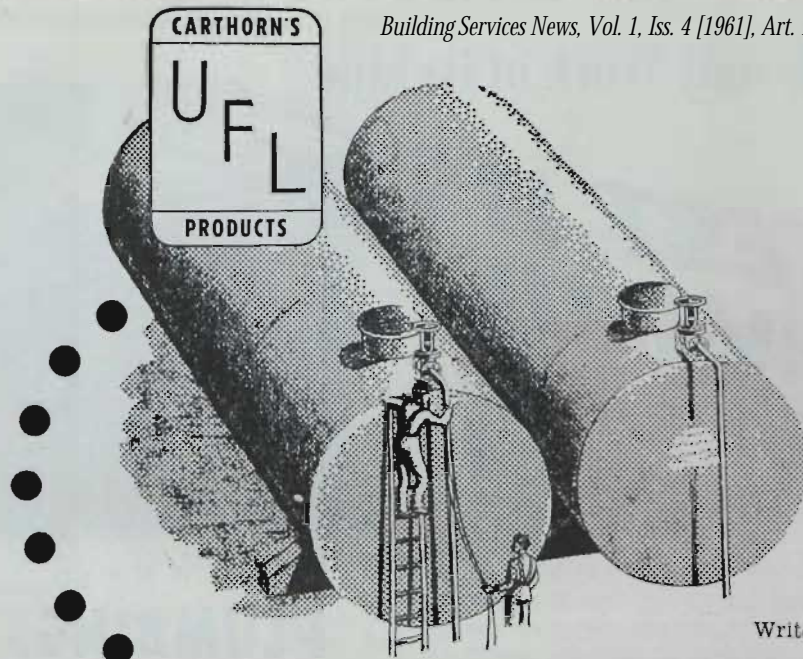
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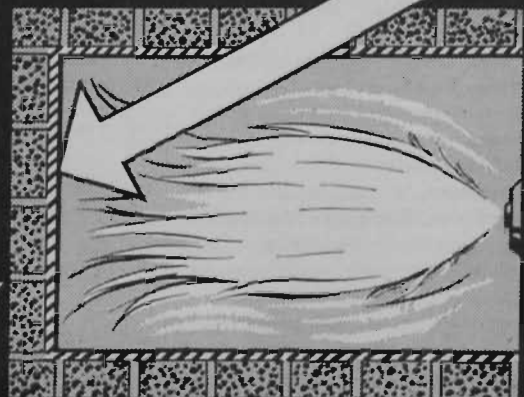
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FACULTY OF PLUMBING . . . A. L. Townsend, M.R.P., M.R.S.H., a Lecturer at the Oxford College of Technology continues here the first part of a four stage course in plumbing. The author has closely followed his own lecture programme and has paid particular attention to scientific and technological innovations.

the make-up and behaviour of plumbing materials

How does one decide which is the right way to do a job, and which are the right materials to use for it? Experience helps, of course, but the real key to these problems is technical "know-how." Know-how merely means a sufficient knowledge and understanding of the basic scientific principles which govern all plumbing design and materials, and which must be applied in even the simplest plumbing operation.

It helps one to learn more quickly from experience, and, even more important, it tells one *why* a job should be done in a certain way, so that a reasoned choice of method and material is possible.

The Physical Properties of Matter.

—The skilful plumber needs to know a good deal about the properties of matter, and the basic rules which govern them.

There is some likeness between the meaning of the words "properties" and "characteristics," and sometimes one is used for the other, but we shall stick to "properties."

"Matter" is the scientist's word for materials of any kind and, different materials can be identified by the qualities or properties which they possess.

Solid objects

All matter occupies space.—Air and water occupy space and so they are materials just as much as are bricks and other solid objects. Before a new hot water system is filled with water the boiler, pipes, and hot storage vessel are full of air which occupies these apparently empty spaces.

No two pieces of matter can occupy the same space at the same time.—Air and water are both forms of matter, and you know that the new hot water system is full of air. Since air and water cannot be in the same space at the same time, the system cannot be filled with water until the

air has been got out. This explains why a vent pipe is put on the top of the hot store vessel to allow the air to move out as the water fills in.

All very simple—when you know how. Everything which follows is just as simple, and just as useful.

All matter has weight.—The weight of lead is a well known property of that material. If one wanted a piece of material that was small but heavy, one would choose lead because of its property of heaviness. If one wanted something light one would look for a material which had the property of lightness—aluminium perhaps.

Air and water have weight, but water is 800 times heavier than air. This explains why hot water pipes are graded to rise to the vent which is fixed at the highest point of the hot water system. Since water is heavier, it will fall and fill the lower parts of the system first, pushing the air to the highest point in the system where it can escape through the vent pipe.

All matter is inert; that is, no matter or material can move of its own accord. The air in the emptied down hot water system did not move out until the force of the greater

A. L. TOWNSEND, under the heading, "THE MAKE-UP AND BEHAVIOUR OF PLUMBING MATERIALS," this month deals with the physical and chemical properties of matter. He also makes some notes on pressures.

Next month he will discuss the Chemical Composition of Matter and the reduction of Metallic Ores.

weight came to push it out. It is important to remember that matter—air and water in particular—cannot move unless some force or forces make it do so.

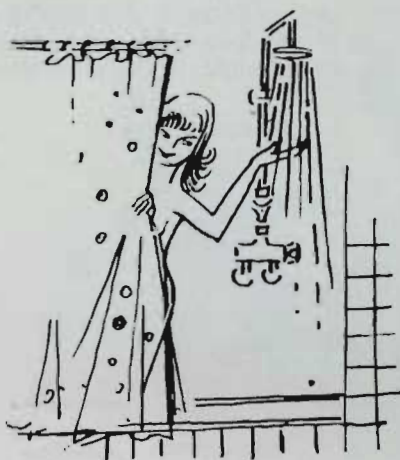
The action of Forces upon air and water have a very important bearing upon the design and way hot and cold water, sanitary, and central heating systems are installed.

Matter can exist in three forms, or "states."—These, and the ways of telling them apart, are given in the following table:—

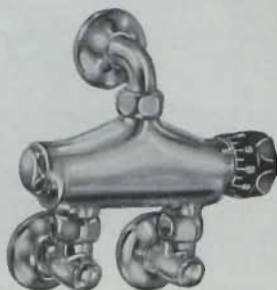
continued page eleven

Physical state.	Volume or size	Shape	Remarks
solid	constant (always the same).	constant	rigid (resists alteration of shape by pressure).
liquid	constant	variable (according to shape of container).	fluid (opposite to rigid); will flow to take up shape of containing vessel)
gas	variable	variable (tends to fill space in which it exists).	fluid

Nine



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Automatically Controlled Thermostatic Mixing Valves

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from page nine

Plumbing materials

When matter changes from one state to another, this is called a **change of state** or a **physical change**. Water provides a clear illustration of this kind of change. At normal temperatures it is a liquid. Cooled to 32 degrees F., it will freeze and change to the solid state (ice). Heated to 212 degrees F. at standard atmospheric pressure (14.7 lbs. per square inch), water turns to steam, that is, to the gaseous state. Later, the explanation of the physical change and its effects on plumbing materials will be dealt with, but for the moment it is enough to remember the following points which help to identify it:

The substance itself is not changed (ice, water and steam are all H_2O (water), in different states).

Temporary

THE change of state is temporary (the ice can be melted back to the liquid water, and the steam can be condensed back to the liquid water).

Notice that to freeze water heat has to be taken away from it, and to turn it into steam heat has to be added to it. Clearly, heat can affect the state of a material, and this will again be dealt with later.

A NOTE ON PRESSURE.

Pressure can also greatly influence the state of matter; but before discussing its effects it is necessary to understand the structure of matter, and particularly the reason why it can exist in three different states. It has been said in a previous article that matter is composed of separate molecules which are held or "pulled" together by a force called cohesion. However, they are not steady, but are always vibrating to and fro. The chemist calls this "molecular vibratory motion." How then do substances like iron, solder and so on, which appear to be so firm and solid, keep together or even keep their shape if all their molecules are moving?

Each molecule attracts or pulls its neighbours to itself by what is called the inter-molecular force of cohesion. If this force is very great, the molecules will hold together tightly and

rigidly, and the substance will be firm, rigid, and, in fact, solid. Should the cohesive force weaken because of the chemical or physical condition of the substance, then the molecules can more easily be pushed out of place. The material will become less rigid and will tend to flow; in other words it will become liquid.

Further loss of cohesion between the individual molecules will allow them to move considerable distances apart. The material will not merely be fluid; it will be so fluid that it will flow in all directions to fill its containing space. In short, it will become a gas.

If a gas is compressed by some mechanical means, its widely spread molecules will be pressed closer and closer together. As they come closer, the cohesive force between them becomes stronger. Eventually if sufficient pressure is applied, the inter-molecular cohesive force will become strong enough to hold the molecules reasonably close together, and the gas will change into a fluid. If the compression force (pressure) is released, the liquid will return to its gaseous state.

THIS fact is used to separate the gases which make up the air. If atmospheric air is sufficiently compressed under carefully controlled conditions of temperature and pressure, it will change from a gaseous to a fluid state. When the compression forces are released, the air is able to revert to a gas. Since the elements which make up air become gases at different temperatures, it is possible to collect them separately, and store them in cylinders for use in welding, and so on. In this way oxygen, nitrogen, and argon gases are obtained.

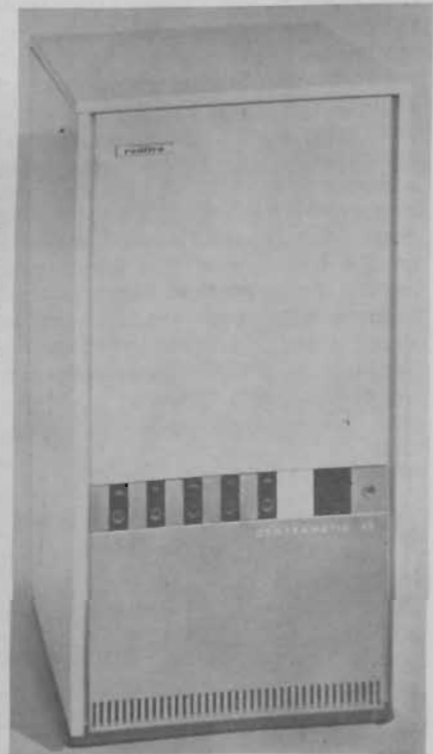
Water can also affect the actual process of a physical change. For example, water, as you know, boils and changes from a liquid to a gas (steam) at 212 degrees F. at Standard Atmospheric Pressure (30 ins. Mercury Column or 14.7 lbs. per square inch).

If a pressure greater than this is acting on the water, it will not boil until a much higher temperature is reached. In fact it will not boil at all until it has gained sufficient heat energy to do so. The extent to which pressure will affect the ability of water to change from liquid to gaseous state is shown in the following table.

continued overleaf



Centramatic '35' Wins Design Centre Award



● Pictured here is the latest automatic oil-fired central heating boiler presented by Newton Chambers & Co. Ltd., Sheffield—the Centramatic "35."

The new boiler, which combines fully automatic working, electric ignition and exceptional fuel economy with fine contemporary design, won a 1961 Design Centre award.

Output: 35,000 B.Th.U's/hr. continuous rating (water transfer). Suitable for supporting, for example, a 30 gallon indirect domestic hot water cylinder plus 130 sq. ft. of radiator surface (including service pipes). If used for heating radiators only, 200 sq. ft.

The Centramatic "35" is stocked in Dublin by Ravensdale & Co. Ltd., Capel Street.

Eleven

Absolute Pressure i.e., Gauge Press- ure plus Atmos- pheric Pressure in lb./sq. in.	Gauge Pressure in lb./sq. in.	Feet Head of Water Column.	Boiling Point at base of water column in degrees F.
14.7	0	0	212
19.4	4.34	10	225
23.38	8.68	20	236
32.02	17.32	40	254

It will be clear that water in a boiler some feet below the feed cistern of a domestic hot water or central heating system can be heated much above its boiling temperature at atmospheric pressure. Should some fault arise in the system, so that the heated water could not circulate freely and so lose some of its heat, then the water would overheat, expand, and possibly exert such outward pressure on the boiler walls that they would burst. If this happens, the high temperature water immediately flashes to steam which fills the room in which the boiler is fitted. The actual bursting of the boiler is less of a menace than this scalding steam.

Interesting

It is also interesting to note that as increased pressure on water raises its boiling point, so reduced pressures upon it reduce its boiling point. At 2,000 feet above sea level the atmospheric pressure is about 13.7 lbs. sq. inch. In this reduced atmospheric pressure water boils at 208 degrees Fah.

If one takes a ball valve to pieces and puts it back together again, one is better able to understand just how and why it works. It would help considerably if one could take the various plumbing materials to bits to examine how they are made up, for the chemical composition of a material has an influence on its durability, strength and fitness for use. The plumber cannot easily do this but the chemist can, and so you must rely upon what he knows and is able to tell you about the chemical build-up of materials.

He will tell you that the smallest separate particle of material that it is possible to visualise, which would be far too small to be seen, is called a molecule. A molecule is composed of atoms. Sometimes it is made up of atoms all of the same kind, so that every single atom in the material is

of the same type. Such materials are called **elements**.

The following table gives a list of some of the elements which are commonly used in plumbing. The

Plumbers materials

chemical symbols by which these elements are known are also given.

Element.	Chemical Symbol.	Remarks
Aluminium	Al	metal
Argon	A	gas
Calcium	Ca	metal
Carbon	C	non-metal (solid or gas)
Copper	Cu	metal
Hydrogen	H	gas
Iron	Fe	metal
Lead	Pb	metal

continued page thirty-two

Represented Ireland at German International Competition



● William
Jackson



● Michael
McDaid

Two young plumbers from Dublin firms made up part of an eighteen-strong Irish team which competed against an international "line-up" at the tenth International Vocational Training Competitions held in Duisburg, West Germany, from July 1 to 15.

Teams from France, Spain, Portugal, Italy, Great Britain, Austria, Switzerland, West Germany, Holland and Belgium were competing.

Ireland has taken part regularly in these competitions since 1957 and has obtained eight firsts, eight second and nine third places.

The party was accompanied by Mr. O. Flanagan, Chief Inspector; Mr. Grimes, Inspector, and Mr. MacDaibhid of the Department of Education, and also by Messrs. W. J. N. O'Brien, and J. Bolton of the College of Technology, Bolton St., and Mr. W. Trundle of the College of Technology, Kevin St., Dublin.

The group was addressed by the Minister for Education on the eve of departure.

Michael McDaid (21), of 4 Beacon Hill, Dalkey, is an ex-pupil of Omagh C.B.S. His late father, Hugo, was a plumbing contractor with business premises in Omagh.

Michael came to Dublin to take up an apprenticeship in plumbing with H. A. O'Neill, 162 Lr. Rathmines Rd., and has been six years in the city. He will finish his apprenticeship in September next.


He took first place in senior plumbing at the trade tests at the annual Technical School examinations. Last year he competed with the Irish team at Barcelona and got fourth place.

★ ★ ★

Seventeen-year-old William Jackson, of 15 Mount Pleasant Terrace, Ranelagh, Dublin, has been an apprentice plumber at Guinness's for the past three years and is following in the footsteps of his father, Thomas, who is also a plumber in Guinness's.

William took first place in Junior Plumbing in the Twenty-Six Counties at the Departmental examinations last Christmas.

It is his first time taking part in these international competitions. He is the eldest of a family of six.



AN IRISH PLUMBER & HEATING CONTRACTOR SPECIAL SURVEY

VENTILATION

DISCERNING PUBLIC SEEKS COMFORT ADVANCES

THE rising standard of living prompts a growing public awareness of the availability of new ideas for the improvement of creature comfort. House warming enjoys a tremendous boom and now a discerning public seeks similar comfort advances in ventilation.

Business managements become increasingly aware that ventilation is something more than the mere provision of statutory amounts of air. Convincing surveys show that modern ventilation techniques can materially improve the moral tone and productivity of their staffs and workpeople.

In the home, the desirable creature comforts are enhanced by widespread acceptance of modern space heating, insulation and ventilation methods.

Ventilation may be defined as a process of removing vitiated, or used air from a space and its replacement with fresh, clean air.

Air change is an essential feature of the ventilating process. It is a continuing process and constantly warm but contaminated air is being expelled from an occupied building and fresh, colder air introduced into it. The

continued page fifteen

INSULATION

ACCEPTANCE AS AN ESSENTIAL FUNCTIONAL REQUIREMENT

ACEPTANCE of thermal insulation as an essential functional requirement of modern building and plumbing services is quickly gaining ground.

In a great number of fields thermal insulation aims to prevent all unwanted heat losses.

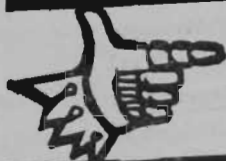
The simple principles are quickly grasped as soon as the means by which expensive and discomforting heat losses occur, are understood.

Heat "flows" always from a substance at higher temperature to one at a lower temperature. The heat always flows from the hotter to the cooler substance—hence the commonly used expression, "Heat Loss." Furthermore, this heat loss will continue until both substances are at the same temperature. That is, unless some form of thermal insulation is applied to insulate the bodies of differing temperatures and so intercept and minimise the heat transfer losses.

Heat Transfer may be by any one of the following or it may be by combination of two or more of them.

Conduction.—Heat flows through or along a material or from one material to another in contact with it.

continued page eighteen

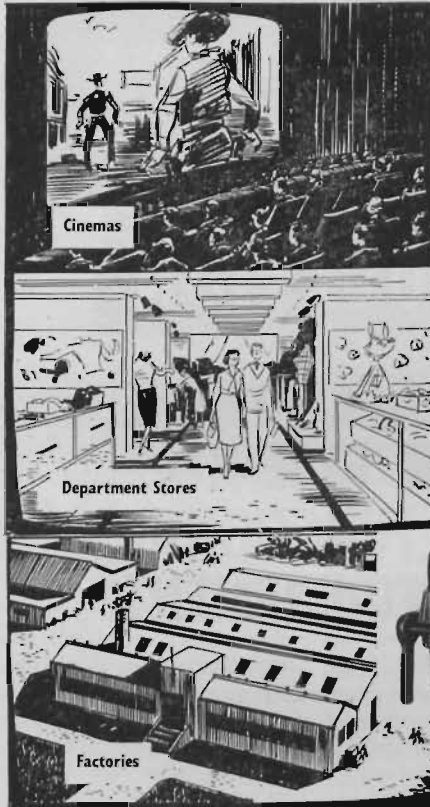


This special survey—the first in a series on important aspects of the plumbing and heating trades—has been compiled by technical expert A. L. Townsend, A.M.I.P., M.R.S.H., a lecturer at the Oxford College of Technology.

Trust

VOKES

K.600 KOMPAKS to clear the air



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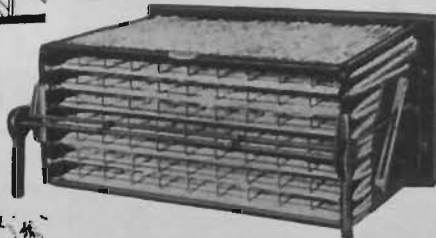
Department Stores

Factories

Perfected by years of research and development in the Vokes laboratories and in the field, the K.600 'Kompak' air conditioning filter is the most efficient as well as the most widely used of its type. Features which have led to its popularity include long life, reliability and extreme ease of maintenance.

Efficient air conditioning filters are essential in the provision of clean

air inside buildings of all kinds. Impurities in the air supplied to factories can cause contamination of products or damage to valuable plant; in public buildings unfiltered air shortens the life of furnishings and decorations. Vokes K.600 'Kompaks' are installed in the air conditioning systems of large commercial and industrial office blocks, factories and engine test houses, public libraries and picture galleries, hotels and cinemas, concert halls, hospitals, multiple stores and establishments for scientific, pharmaceutical and photographic research and processing.



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'Caposite' amosite asbestos
moulded blocks and pipe sections

Also full range of plastic materials
and hard-setting compositions.

VENTILATION

cooler incoming air will have to be warmed in winter if local cold draughts or general cooling of the warmed enclosures is to be avoided.

The Purpose of Ventilation may be conveniently classified as: (a) Hygienic, i.e., appertaining to the health of those in the ventilated space, and (b) Physiological Comfort Conditioners, i.e., factors which aim to promote greater creature comfort.

Extending these points we find that the removal of vitiated air (Health) is vitally necessary:—

To avoid undue concentration of carbon dioxide and consequent reduction of the life-giving oxygen content of the air within the ventilated space.

To reduce odours to imperceptible limits.

To prevent concentration of bacteria laden particles in suspension in air within the ventilated space.

The value of air change for hygienical purposes becomes clear. The greater the rate of air change the more effectively will this particular function be served, but an economic compromise must be made between air change rate and the consequent imposed "Infiltration Losses" upon the space heating plant. Otherwise, space heating costs will soar beyond reasonable economic level.

FACTORS AFFECTING PHYSIOLOGICAL COMFORT CONDITIONS

1.—Removal of excess moisture (Humidity) from air in ventilated space.—Moisture in the form of invisible gaseous water vapour is absorbed into air. Dry air will more readily take up such moisture than air which is already moist.

Excess humidity of air retards its ability to absorb further moisture and the comforting absorption of perspiration is diminished.

Humidity varies with air temperature and it can be measured on special equipment.

Without going too deeply into this subject of hygrometry, the following simple facts are important principles of ventilation aims.

Humidity is simply a condition of air with regard to its moisture content.

Relative humidity is the ratio of the amount of moisture in air, at a given temperature, to that maximum

amount that the air could hold at the same temperature (R.H. is expressed as a %). For example, if air at a given temperature held just half as much moisture as the maximum possible at that temperature the air would be described as of 50% relative humidity.

Saturated air is air holding its maximum amount of moisture possible at whatever temperature the air happens to be. (See Table I.).

Dew point is that temperature to which unsaturated air falls so that it eventually becomes saturated.

To take one example, suppose air at 62 degrees F. and 100% R.H. is cooled to 52 degrees F., from Table I. it can be seen that at the lower temperature the air cannot hold so much water vapour as it did at the higher temperature. The excess moisture condenses and settles in beads of water on cold impervious surfaces. Hence it becomes clear that the nuisance of condensation in buildings is related also to the problem of ventilation.

TABLE OF DEW-POINTS
(Amounts of water vapour required to saturate air).

Air Temperature °F.	Weight of Waste Vapour in grains /H ³
42	3.08
52	4.39
62	6.17
72	8.54
82	11.67

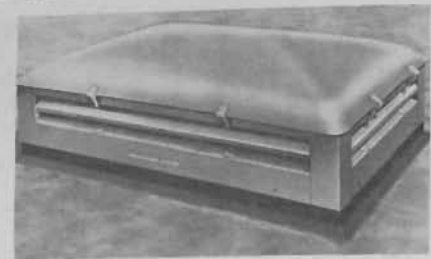
Humidity control in ventilating air requires elaborate plant for large scale systems. Local or portable appliances are available to treat the air requirements for one enclosed room space.

Natural ventilating systems rely entirely on air change, i.e., the expulsion of used, contaminated, possibly moist air, by the introduction of fresh atmospheric air from outside. If the incoming air happens to be dry (of low R.H.) a small airchange rate will suffice to dispel the humidity within. On the other hand, if incoming air is already moist, e.g., on a damp day, greater airchange will be necessary to affect any improvement, if it improves at all.

2.—Provision of Air Movement.

(complete) Air will absorb moisture more readily than still air. Air movement has a cooling effect, too, and it is noticeably cooler if one sits before an electric fan on a hot day which merely circulates air that is already warm in the room. The cooling effect is produced by the volume of air moved over the exposed skin surfaces of the body, with the result that convection losses and evaporative perspiration losses from the body are increased—hence the sensation of coolness.

Excessive velocity of air movement is to be avoided. Air flows of up to 100 ft/min. may be acceptable, even desirable, on a hot summer day, but
continued overleaf



NEWS FROM GREENWOODS

● The new "Greenwood Airvac Maxadome" patent rooflight ventilator is designed to provide a large effective area of controlled ventilation with maximum daylight, relative to the size of dome used (above).

Combining low overall height with neat unobtrusive appearance, the "Maxadome" Ventilator is soundly constructed of aluminium and is fully weathered.

● Purpose made in any desired length up to 6 feet, the new Greenwood Airvac "Permavent" Horizontal Window Ventilator in extruded aluminium gives permanent or controlled trouble-free ventilation with locked window security and minimum restriction of lighting area (below).

Fitted within the glazing rebate at the top of metal or timber windows and doors, "Permavent" Window Ventilators allow removal of vitiated air and eliminate probable condensation damage to decorations.

Irish Agents: The Technical Sales Company, 79 Lower Leeson Street, Dublin.



VENTILATION

in winter such excessive air movement would give rise to complaints of chilling draughts. A velocity of between 20 to 40/ft.min. is usually acceptable and sufficient in winter ventilation of domestic dwellings and places of sedentary occupation. But once again, velocity of air movement cannot be finely controlled in simple natural ventilation.

Heat required

Too high an air motion also means more heat required to temper the air. A sensible economic antidote is the scientific application of draught excluder materials to door and window frames.

It is worth noting that much greater volumes of air will need to be introduced into a building to modify humidity and temperature (both comfort conditions) than will be necessary to supply breathing air of satisfactory chemical quality (hygiene).

Ventilation Requirements.

Having seen the purpose of ventila-

tion, the question now becomes: "How is this purpose achieved?"

Rate of Fresh Air Supply.

It is generally accepted that for domestic dwellings the rate of ventilating air change should be such that each occupier of the ventilated space gets 600 cubic feet of fresh air per hour.

Thus, in a living room of 2,400 cubic feet volume, four persons could exist in hygienic air with only one air change per hour.

The same number of people in a room 1,200 cubic feet volume would need ventilation at the rate of two air changes per hour to obtain the same hygiene standard.

Large kitchens with hot, steamy atmospheres may need air change rates of up to 20 changes per hour in order to modify humidity and temperature within.

Canteens, restaurants, and assembly halls where high density of occupation will give rise to increased humidity and temperature, may need ventilation rates which will provide as much as 1,000 cubic feet of fresh air per seated person. (Note: With regard to heating effect of human body, an adult at rest will emit some 350 B.t.u.s. of heat. In short, 10 adults emit as much heat as one 1kW electric fire. It will be clear that in places of high density of occupation the problem of heating the space becomes one of cooling it when it is fully occupied).

The building function, design, and space will have a bearing on the required rate of ventilation.

Recommended ventilation rates are obtainable from many published works. British Standard Code of Practice No. 3, Chapter 1 (C), at 4/- from 2 Park Street, London, W.1, is a useful source, whilst the Institution of Heating and Ventilating Engineers' Guide To Current Practice, published annually, will be well known to readers of this Journal. It is obtainable from 49 Cadogan Street, London, S.W.1, or from any bookshop on order.

Air movement

The importance of this requirement has already been established. It is achieved by wind pressure, air temperature differentials, or a combination of both in natural ventilation arrangements. Where quantity of air

flow must be controlled within limits natural means of ventilation are inadmissible and resort has to be made to mechanical ventilation and the use of fans to propel air to and from the ventilated space.

Air Temperature.

This already affects physiological
continued page twenty



PRODUCTS FROM VOKES

● Vokes Limited, Henley Park, Guildford, Surrey—represented in the 26 Counties by the Leinster Engineering Co. Ltd.—are manufacturers of a wide range of air filters, cover panel types, multiple units and automatic models.

The main filtration equipment consists of the Super-Vee, K.600 Kompak, Autoroll Mark II, S.C., and "Absolute" types.

The Super-Vee is an inexpensive, expendable filter using a unique synthetic fibrous filter medium impregnated with an adhesive.

The standard K.600 Kompak is a filter particularly suitable for use in heavily dust-laden and sooty atmospheres.

The "Renovair" unit—pictured here—for the removal of smoke and airborne contaminants, has unlimited possibilities in canteens, restaurants, public houses, etc.

The heart of the unit is a 5" deep Vokes 44 "Absolute" filter panel housed in an attractive metal case with an integral fan, electric motor and built-in acoustic chamber to ensure quiet operation. It is suitable for either wall or floor mounting and can either be used continuously or as needed.



BREEZA FAN

● From the Breeza range of heavy duty fans, a model fitted with ball bearings sealed during motor assembly which, the manufacturers claim, obviates the need for lubrication for many years.

Breeza fans are manufactured by the London Fan and Motor Co. Ltd., 331 Sandycroft Road, Richmond, Surrey.

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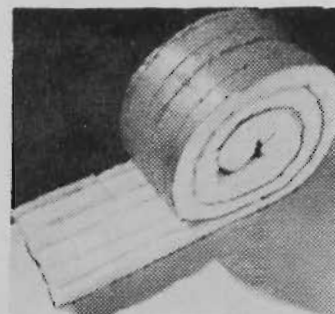
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INSULATION



'ROCKSIL' FROM M. A. BOYLAN

● Rocksil—a long fibred rock wool of great resiliency which gives a high degree of protection—has established itself as being ideal for heat insulation and frost protection.

"Rocksil" rigid pipe sections for the insulation of pipework up to a maximum temperature of 600°F. (260°C.) are exceptionally strong and robust and will suffer falls and the rough handling inevitable in transit without damage.

Moreover, each section is made with extreme accuracy which ensures uniformity of pipe diameter. The standard length is three feet for pipe sizes from $\frac{3}{4}$ " bore to 12" bore in $\frac{1}{2}$ " to 2" thicknesses of insulation. Six different kind of finishes are available with canvas or scrim cloth wrapping, or plain.

"Rocksil" contains no slag or any kind of organic matter. It is non-corrosive to ferrous and non-ferrous metals and offers no sustenance to vermin.

There are numerous "Rocksil" products suitable for heating contractors and particulars can be obtained from M. A. Boylan Limited, 59a Harcourt Street, Dublin.

from page thirteen

Conduction heat transfer increases as the temperature difference throughout the length of material increases or as the temperature difference between the two materials in contact increases.

Eighteen

<https://arrow.tudublin.ie/bsn/vol1/iss4/1>
DOI: 10.21427/D7N13K

Convection.—This form of heat transfer occurs in liquids and gases. It involves circulatory movement of heated particles of matter within the material heated. As water or air is heated it expands and becomes less heavy bulk for bulk than cooler water or air. The cooler heavier materials then fall by gravity and push the lighter, heated particles upward and away to expose more heated surface to colder, heat-extracting water or air.

Convection losses are increased as the temperature differences increase. They are also increased by air movement. Conversely, they will be reduced as temperature differences level off or as air or water becomes less mobile.

Heat emitted

Radiation.—In this case heat is emitted from a hot body to a colder one in the form of heat energy wave motions. In many respects this is similar to light transmission. Radiant heat does not appreciably warm air through which it passes but it will warm any solid body which intercepts its ray. Radiant heat moves in straight lines. It can be "bent" or deflected by reflecting devices, but it is important to realise that to receive radiant heat a body needs to be in view of the radiant heat emitting source.

The purpose of thermal insulation now becomes clear. It is to so enclose a heated body, or a substance, at higher temperature than its surroundings (e.g., cold water surrounded by air at 32 degrees F.) in such a way as to prevent or markedly reduce heat loss from the substance within to the colder substance without. This applies particularly to prevention of heat loss from hot water pipes, boilers, store vessels, etc., as well as to "cold" water fittings. In the case of thermal insulation in structure preventing loss of heat from inside the building to colder outside air, the principle remains the same. In summer, when the structural insulation helps to keep the building cool by reducing the solar radiation heat gain, the principle still holds good except that in this instance the insulation is protecting the heat absorbing substance rather than the heat emitting sun.

Properties

The Properties of thermal insulating

materials vary.—It is worthwhile knowing some of these properties in order that a reasoned choice of mater-



GYP SUM AND FACTORY INSULATION

● Gypsum Industries Limited have made an important contribution to building in Ireland over the years, and of particular interest to the industrialist is the application of Gypsum products to factory construction.

Plasterboards and plaster are, of course, extensively used for lining walls, ceilings and partitions but a more specialised contribution of Gypsum Industries Ltd. to industrial building is in the insulating of factory roofs.

The Steletex System incorporates Irish-made Gyptex plasterboards which have an aerated gypsum core and are faced with special millboard manufactured by the National Board and Paper Mills Ltd. in Waterford. The upper surface of the board is covered with a thin veneer of aluminium foil which affords additional insulation and acts as a vapour barrier.

Ferrokliith structural insulation is now being used to an increasing extent in industrial buildings and is ideal for use as permanent shuttering underneath slabs in reinforced concrete roofs or as an insulating lining to concrete walls.

Recent reductions in the price of Ferrokliith and improvements in manufacture have also been made. The price of 1" thick Ferrokliith is now 7/4d. per sq. yd. ex works, and 2" thick Ferrokliith 10/8d. per sq. yd. ex works.

The thermal insulation of 1" thickness of Ferrokliith is equivalent to approximately 14" of brickwork, and full particulars are given in technical leaflet No. 5, available from Gypsum Industries Ltd., South Richmond Place, Dublin.

INSULATION

ial can be made for different specific applications.

Low thermal conductivity.—This means that the material itself will not be a good conductor of heat. Therefore there will be less risk of the insulation quickly getting as hot as the pipe or material it is applied to protect and thus loose heat quicker than the smaller surface area of the unprotected pipe would.

Porosity.—The value of still air as a thermal insulator has already been referred to. Thermal insulating materials will make use of this known heat insulating property of still air and will therefore be compounded of cellular material to provide multitudes of cells of still, trapped, air.

Fire resistance.—The material should be incombustible or at least offer considerable resistance to fire spread.

Weight.—Though not of prime importance to pipework insulation, this is worthy of consideration in cases where no great extra superimposed

load is desirable, the case of applying thermal insulation above top floor ceilings for example.

Resistance to fungal attack.—This is a desirable property of insulation for situations liable to damp.

Resistance to insect attack.—Worth considering in all cases, when moths have been known to attack and ruin hair-felt insulation.

Resistance to moisture absorption.—This is an important property where insulation is to be chosen for damp situations, e.g., outdoors, or in steamy kitchens.

Surface finishes.—Ready-to-fit materials are much preferred for pipe runs as being easier to apply. A neat uniform finish is assured and the ease with which the insulation can be removed and refixed in repair work are other advantages of this type of insulating material.

To-day, scientifically applied thermal insulation to pipework systems or in building structure becomes an increasing economic necessity.



CYLINDER JACKET

● Pictured here is the Darlington Stilmat filled and polythene covered cylinder cover. The jackets are provided in a number of finishes and are manufactured by Darlington Insulation Company Ltd., West Auckland Road, Darlington, Co. Durham.

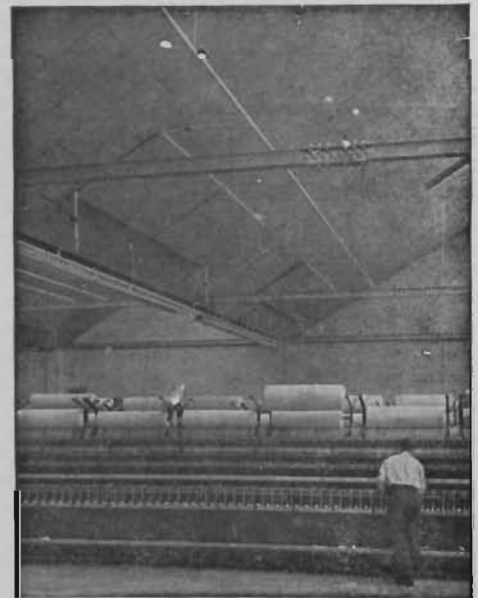
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Nineteen

VENTILATION

from page sixteen

comfort conditions. It is therefore a requirement of some importance. Temperature of air also affects humidity as previously shown; it therefore affects comfort condition so far as perspiration losses from the body are concerned.

Winter external air temperatures will be low and prior to its entry to a ventilated space such air would preferably be "tempered" to prevent cold bores of air into an otherwise uniformly warm air space. "Tempering" may be achieved by placing heat emission appliances so that the incoming cold ventilating air is warmed by passage through, or over these on its way into the building.

If cold air, or air only slightly lower than general air temperature in the room, enters at high velocity, then unpleasant chilling draughts will result.

Humidity

This and its effect on comfort conditions and condensation problems has been briefly outlined above. This important requirement of ventilating air is difficult if at all possible to achieve in natural ventilation. In places of high density occupation for long periods, for process work in which humidity control is an essential requirement, or for the ventilation of totally enclosed spaces, double glazed office buildings to keep down extraneous street noises, etc., special air conditioning plant is being used more and more to meet the demand for full comfort conditions in building ventilation.

This introductory article has aimed to show some of the basic principles involved in ventilation. It should now be clear that ventilation is something more than just opening or closing a window. It should be equally clear that space heating design is very closely related to ventilation requirements and that in the interest of efficient and economic heating, particularly house warming, this fact must be recognised and accounted for in all heating design and practice.

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The first article of a two-part series by
et al.: The Irish Plumber and Heating Contractor, July 1961 (complete iss
W. H. JOHNSON on . . .

planning a shower

THE notes on showers contained in this short series of articles are offered as a refresher for two main reasons.

Firstly, the importance of showers is growing, through fashion, through their space saving potential in small premises, and because they are economical on water and fuel. And secondly, the finer points of installation are sometimes mixed and will bear repeating.

The primary function of a shower is to project a spray of warm water upon a person, usually from above, and to be satisfactory the water must be of the right temperature, volume, and form of delivery.

In those related factors is the crux of the whole matter.

Volume first

LET us take volume first. We have tested roses, generally American, which at moderate pressures (by American standards), 25 to 45 lbs. sq. in., will pass six, even ten gallons a minute. This is quite ludicrous and ostentatious. A frail person could drown at his ablutions, and, less dramatically, about nine tenths of the water never touches the person, and is wasted.

The most that anyone needs for an adequate shower is 2 g.p.m., properly distributed, and the least about $\frac{1}{2}$ g.p.m. The lower figure is meagre, and not recommended unless there is special need for economy. One gallon to 1½ gallons is a reasonable target.

This is where the form of delivery comes in, for the figures given are useful only if the water is properly applied by the rose. The massive mechanically variable American roses and their imitators are usually quite incapable of dealing with small volumes. Even the humbler, smaller, atomiser rose or umbrella spray, while it will cope successfully down to $\frac{3}{4}$ g.p.m., will do so only if the applied water pressure is, by our standards, above average.

No one should under rate the virtues of the plain, pinhole rose, however much it may remind one of a watering can.

Its simplicity, particularly the low resistance to equivalent flow rate, make it admirably suitable for the pressure starved conditions of a typical cistern fed home. For a nominal 2 g.p.m., use a 3" rose, and a 1" diameter rose for 1 g.p.m. and less.

Function

WE are not yet finished with volume, for the actual discharge rate, or volume (as compared to the nominal one) is a function of the water pressures in the system. It is not a practical matter to discuss the upper limits of acceptability when cisterns are used, except in relation to multistorey buildings, and there the stop-valve on the shower may be used as a modulator. But the minima are so often with us that we must make some rules. The heads given are measured vertically from shower rose to underside of cistern, the head in the cistern being sufficient offset against pipe losses in an average system, and within the accuracy required.

The minimum head for mechanical control (q.v.) may be as little as 2 feet. We prefer to aim for 3 feet, and to demand 5 feet. It is a sort of bargaining point when dealing with architects.

For automatic, thermostatic control (q.v.) the requirements are more stringent. Thermostatic controllers are themselves pressure absorbers, and generally, the better the pressure the better the control. The minimum is higher than for mechanical mixing. Thus, a safe minimum head for a domestic shower is 10 feet, and the absolute minimum is 8 feet (once again, q.v.). It is no kindness to give way to a client with a paltry 5 feet who wants a thermostatic controller, for he may blame you for evermore if the control is coarse.

Now it is time to consider tempera-

ture control, and to explain all those q.v.'s.

Inherent in all showers is the bringing together of supplies of hot and cold water, and mixing them, with a means of controlling the quantity of each supply in the mixture. There

continued overleaf

New shower fitment



MADE of strong glass-fibre, the "Halo" corner-fit shower is full-size yet needs little space.

In plan-view, the "Halo" is arc shaped, designed to fit neatly into a corner. A wrap-round plastic curtain guards against splashing.

All fittings are of chrome. The one tap gives easy selection and control of temperature. There is also a special anti-scald valve.

Priced from £46 10s. 0d., complete with taps and curtains, the "Halo" corner-fit shower unit is made by Reinforced Plastic Developments, Shere, Surrey.

Twenty-one

from previous page

are two broad ways of doing this:

- (a) Mechanically.
- (b) Thermostatically.

Arrangement

THE simplest mechanical mixer is a tee, with a stop valve on each incoming pipe (Fig. 1), and this arrangement is commonly operated by opening the hot valve fully, and the cold valve sufficiently to regulate the temperature.

A proper mechanical mixer, for example to B.S.S. 1415, is in itself the tee piece, the shut off, and the proportioner, requiring no non return valves (Fig. 2) or stop valves. Anti-scald valves are mechanical mixers with the addition of a device which shuts off the hot water if the cold supply fails. Otherwise they are not automatic.

All mechanical mixers have to satisfy certain installation conditions, and these may be defined as "legal" and "service." The first is nominal and does not guarantee a satisfactory shower. This requires that, since the hot water system will be cistern fed, the cold water supply must come from

the same cistern, or another at the same level. By this, the nominal pressures of hot and cold water are equalised, but it does not guarantee the "service" condition, namely, that they shall remain without fluctuation, and so give satisfactory service.

Fluctuations are almost always due

to the opening and closing of other draw off points on the same pipeline, and the planner should satisfy himself about the chance of this taking place. If it can happen, as in a large house, boarding house, offices and the like, the only satisfactory course is to sup-

fig. 1

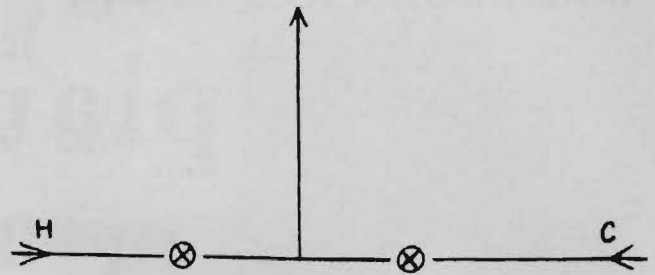
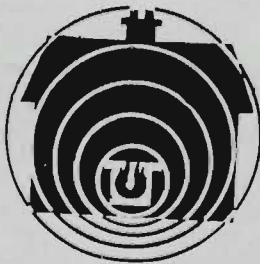
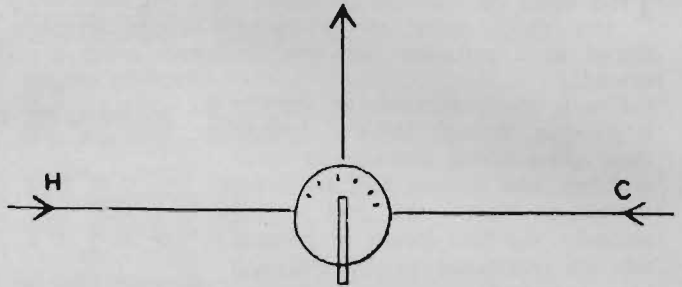


fig. 2



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Luxurious home heating... with THE RYAX WARMHOME SYSTEM

The "Ryax Warmhome" System is a packaged small bore central heating system consisting of the following components:

- Warmhome Back Boiler and Flue Brush
- Warmhome Firebricks
- Four Warmhome Radiators
- Twelve complete Warmhome Radiator Brackets
- One Ryaland Noxi Circular Pump
- One "Ryax Warmhome" neon Control Switch
- Warmhome Towel Rail complete with Control Valve.

The boiler is suitable for installation behind any normal standard 16" open fire. It has sufficient output for the four radiators and one towel rail, and in addition will give an ample supply of domestic hot water. The cost of installation is approximately £160/170 complete.

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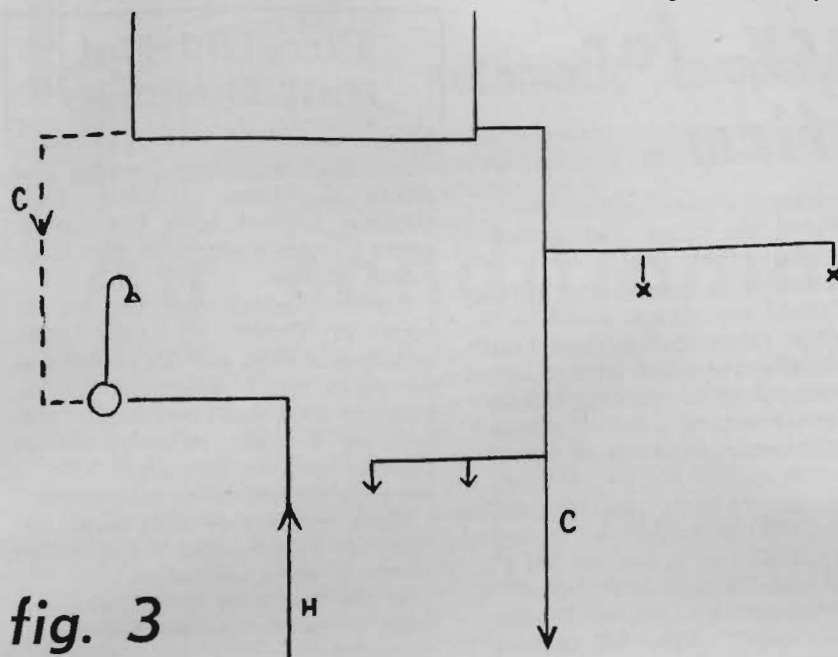


fig. 3

fig. 4

NOTE: A reasonable alternative is to connect point A to the nearest point on the existing downcomer, thus avoiding a new downcomer.

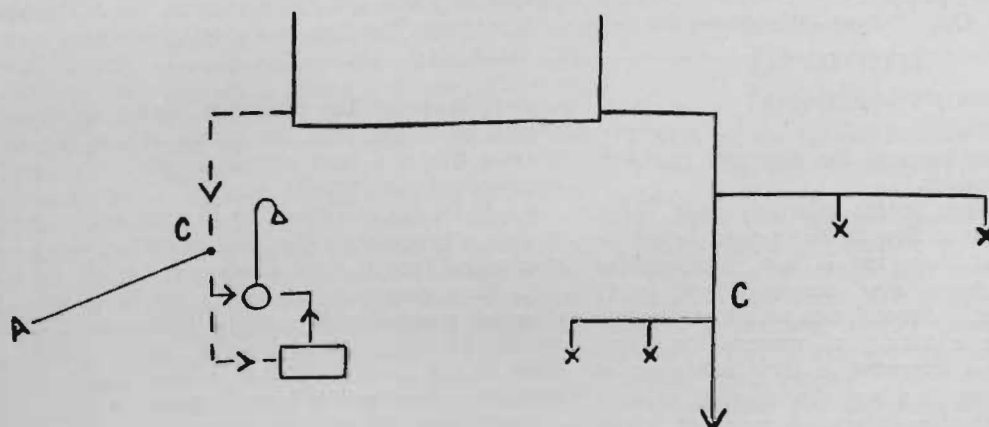


fig. 5

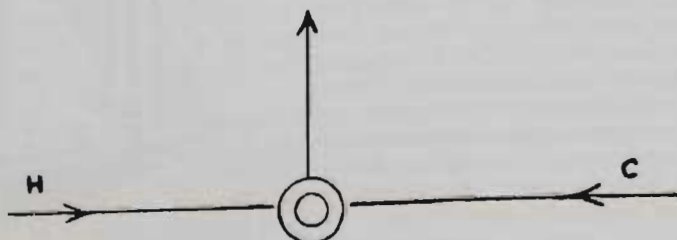
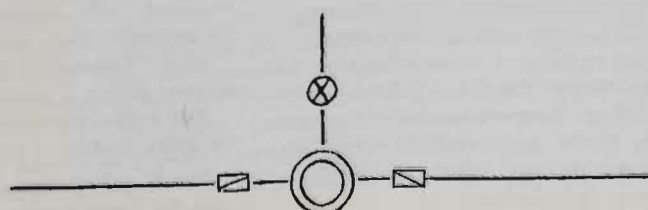


fig. 6



ply the shower by private pipelines from the cistern (Fig. 3). As a minimum, run a separate cold line, and at best put in a 5-gallon immersion heater as well, just for the shower or for the bathroom (Fig. 4). Drastic? Not really, if you are a true campaigner against hotch potch and make-shift.

Alternative

KEEPING in mind that if the heads available are less than 10 feet (possibly 8 feet), the mixing device must be mechanical, there is for the better pressurised situations a convenient alternative to the reconstructions outlined above.

This is the thermostatic mixer, an automatic device whose function, besides mixing, is to iron out the temperature changes resulting from fluctuations in supply pressures.

In the course of exercising this function it will do also what the anti-

scald valve does, i.e., cut one supply if the other fails. In doing this, it is assisted by having a good temperature differential to work it, and it is a mistake to think that by keeping the hot water temperature low, say 120°F., one is assisting; on the contrary.

Except in clearly specified instances, thermostatic mixing valves are not flow controllers, and do not incorporate a shut off. This function must generally be added, and in one of two ways. Either the flow must be controlled by a stop-valve on each inlet, no further stop-valve being used (as in common American practice (Fig. 5).), or there will be a non return valve on each inlet, and a single flow control valve on the outlet (Fig. 6). The latter method is the most popular here, but it has disadvantages which both the

continued overleaf

Ryax agency for Dublin firm

MESSRS. P. Donnelly & Sons Limited, 20 Georges Quay, Dublin, have been appointed Irish agents for Ryax Heating Limited of Manchester.

This appointment will see the introduction of the now well-established "Ryax-Warmhome" System to the trade.

The "Warmhome" System is a packaged small bore central heating system consisting of the following components:—

- Warmhome back boiler and flue brush;
- Warmhome firebricks;
- Four Warmhome radiators;
- Twelve complete Warmhome radiator brackets;
- One Ryaland Noxi circulator pump;
- One "Ryax - Warmhome" neon

control switch; and a Warmhome towel rail complete with control valve.

The boiler is suitable for installation behind any normal Standard 16" open fire either of the raised hearth or underfloor draught type. It has sufficient output for the four radiators and one towel rail and in addition will give an ample supply of domestic hot water.

The approximate cost of installation—£170—represents a low initial outlay.

Some of the more important points of the system are outlined below.

The system does not alter the appearance of the fire and is easily installed.

All components are designed to ensure easy and speedy installation.

The new Waveline radiators that

Fire Did Not Halt Business

IT was a case of "business as usual" at the Broadstone works and offices of Messrs. Hendron Bros. (Dublin) Limited again this month, where a recent outbreak of fire caused serious damage.

The fire, which was one of the worst in Dublin for some time, destroyed a store and its contents at the works but a spokesman for the company told the 'Contractor': "The outbreak has not seriously affected business and we have been able to carry on without much interruption."

Three fire brigade units fought the blaze for an hour and a half before getting it under control.

At the height of the blaze people living in nearby houses had to be evacuated.

largely contribute to the success of the system are wafer thin and elegant.

The specially designed damper permits maximum control of the boiler.

from previous page

plumber and the customer ought to consider.

First is the relatively high resistance to flow of non return valves, so that their use is not recommended under a new minimum head of 15 feet. Second, non return valves can, for a variety of reasons, be somewhat imprecise in their behaviour at times, in a way that is most unlikely with stop valves. A swing in favour of inlet stop-valve control is worth encouraging. It has another virtue, that there are ready made and conveniently situated isolating valves for the purpose of doing maintenance on the controller.

Recapitulate

IT is time to recapitulate.

1.—From 2 gallons per minute, delivered through a simple (pinhole) rose of 3" diameter, down to $\frac{1}{4}$ gallon to 1 gallon through a 1" diameter rose, provides adequate water for the purpose of shower bathing. You can concentrate upon the rose and forget the volume, which will take care of itself.

2.—Pressure head, for an average system of pipework, should be measured, not too accurately, from underside of cistern vertically to the shower rose.

3.—The target for minimum head should be 5 feet, with the option of relaxing this if a brisk shower is not an essential requirement.

4.—From the minimum up to 8 to 10 feet, a temperature regulator of the mechanical type is most satisfactory.

5.—In a proper installation a mechanical controller is equally satisfactory at the higher pressures, but from 10 feet (or 8 feet) head, a thermostatic controller may be considered.

6.—Between the minimum (see Fig. 5) and about 15 feet, a thermostatic controller should have inlet stop valve flow control, not non return valves.

7.—According to British Waterworks regulations, any mixing device (with one exception), shall be supplied with water from a cistern or cisterns.

8.—Satisfactory mechanical controller operation is possible only when the hot and cold water supplies are free from pressure fluctuations, and are of nominally equal head. This may have to be engineered.

9.—If the hot and cold water supplies are of unequal head and/or are subject to fluctuation, the solution is to use a thermostatic controller.

Nine rules may seem a lot, but between them they cover the overwhelming proportion of situations likely to be met, and in their observance is the clue to confident shower installation.

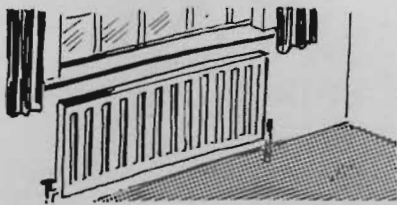


MESSRS. J. J. Donaldson of 33/35 Capel Street, Dublin, have announced the introduction of the "Cascade" bath shower.

The "Cascade" needs only three screws giving a strong attachment.

The unit is manufactured in London by John Sydney Ltd.

Retail prices: Standard model, 75/-, and De Luxe Shower, 84/-.



automatic temperature control - - -

Air conditioning controls

IN the strictest sense the term air conditioning covers the treatment of air by heating, cooling or humidification. The term, however, has come to be used loosely to cover all forms of installation which use air as a heating medium and it is in this simpler form that it is most common.

On first sight a modern air conditioning plant seems a most complex installation, and in its final sense it is complex, but when broken down it can be seen that it really is a number of separate plants each performing a function either individually or in conjunction with other functions. It is with this approach that any control scheme should be visualised so that with a number of basic controls the more complex whole is built up to suit the requirements of the complete plant.

The basic warm air plant would be generally as fig. 1—fresh air is pulled through a heater battery by a fan and this air is discharged into the space to be heated. The simplest form of control is shown—a space temperature detector in the room controlling the input of heat to the heater battery. If an extract system is used then the space detector could be replaced by a duct thermostat in the extract where a better average temperature will be obtained.

It can be seen that if the space or duct thermostat is satisfied for a long period then the heater battery becomes cold and fresh air is brought in at temperatures below that of the space temperature, creating a cold draught. To prevent this a low limit thermostat in the discharge duct is arranged to either open the control valve on the heater battery or provide an increased setting on the space detector which will have a similar effect.

To continually heat fresh air can be uneconomic where it is possible to use air brought back from the heated space. The recirculated air can be mixed with the fresh air intake in predetermined quantities through set dampers, or alternatively it can be

automatically controlled. In this case the fresh air and recirculated air dampers are motorised and operated in sequence with the control valve on the heater battery—this being known as a two-stage control system.

The same

THE method of heating the air can be by steam, hot water or electricity, but the basic control scheme remains the same.

At this stage variations in control can be introduced, such as Winter shift, which allows space temperature to be raised as outside temperature falls. An exhaust damper to be opened when the recirculated air damper is closed is another variation, but note that these are only variations and the basic control remains the same.

Having provided heating in Winter we can further provide humidity—this being the addition or removal of moisture to the treated air and is particularly necessary in some industrial applications. This control is generally effected in three ways.

- A humidifier of the free steam type is fitted before the heater, it being under the control of a humidistat in the heated space.
- A separate heater battery warms the incoming air, which is then subjected to an air washer giving almost 100% relative humidity. At this stage it is controlled by a dewpoint thermostat to a temperature which, when the air is reheated in a second stage battery, gives discharge air at correct temperature and humidity. (See fig. 2).
- Using two heater batteries as above the control of the preheater battery is by a humidistat in the space or extract duct from the space.

The only further treatment we can give the air is to cool it for mild weather and Summer use. This is done by using a cooling battery which

By

**R. E. AYERS,
M.A.S.E.E.**

can be fed direct with liquid refrigerant or with chilled water. Alternatively where an air washer is used the cooling can be applied to the washer. Since it is not normally the practice to cool and heat at the same time, any control system must provide sequencing for these two functions and it is generally accepted that a "dead zone" of temperature be provided between the two functions to prevent hunting at the change-over point.

Brought together

THUS all the various functions can now be brought together into a scheme such as fig. 3, which shows a three-stage air washer system with constant dewpoint control.

This appears complicated but further study will show how it separates into the functions already described above. Let us examine this control scheme more closely.

Ventilation: The dewpoint detector through its control box operates the control valve on the preheater battery and in sequence the fresh air and recirculated air dampers. The air thus heated passes through the washer, becomes saturated, and then is available for the next stage.

Heating: The saturated air is passed across the reheater battery, where its temperature is raised and the humidity decreased, this section being controlled from a space detector or a duct detector in the extract duct.

Cooling: Here chilled water is added to the washing water. The control box provides a dead zone between the completion of the ventilating stage and the commencement of the cooling stage.

Within the space of this article it is *see page twenty-seven for illustrations and continuation*

Twenty-five

SELL ELECTRIC WATER HEATING *this Summer*

You have plenty of support when you suggest **ELECTRIC** water heating to your customers. A large scale advertising campaign is helping to convince the public that electric water heating is the best, and a full range of water-heating appliances enables you to provide the ideal system for every home.

Now is the time when housewives hate to think of having to light fires to provide hot water, so just suggest **ELECTRIC** water heating and you've a sale in your hands.

Electric water heating is handier



FIRE HAZARDS

BLOWLAMPS.—Many a roof has taken fire through accidental or careless blowlamp flame impingement on dry timbers. Forethought for possible fire hazard involved would have shown the wisdom and need to have "first aid" fire-fighting equipment on hand before taking the blowlamp into the roof space—and costly fire damage might have been prevented.

Downstairs too the blowlamp "fire bug" needs careful watch. Draped curtains, furniture, and skirtings all fall easy prey to the hungry flame placed inadvertently close whilst attention is rivetted on the job in hand.

PETROL BLOWLAMPS have their devotees but the flammability of the spirit makes them potentially more dangerous than the much lower flash-point paraffins.

PARAFFIN BLOWLAMPS, though perhaps safer, still leave much to be desired to reduce their fire hazard propensities. Have you, for example, some time run out of methylated spirit to pre-heat the paraffin blowlamp—and you miles from anywhere? Have you then, in frustration, tried to pre-heat with some lower calorific valued paraffin and impatiently pumped the lamp to get it going? (Did the Fire Brigade arrive in good time to save the property or were you lucky and the gusher of ignited paraffin only shoot six feet over a concrete floor?)

BUTANE GAS BLOWLAMPS offer many practical and economic advantages. Not least of these, the ease with which the flame can be lit, extinguished, and re-lit as required. For this reason this newer kind of blowlamp offers practical, almost automatic, contribution to the lessening of fire hazards of this kind.

ACETYLENE GAS is profitably used by the modern plumber for so many up to date techniques such as lead burning, bronze welding of copper tubes and the fusion welding

continued page twenty-eight

from page twenty-five

AIR CONDITIONING CONTROLS

not possible to examine all the variations that can be applied to the basic schemes. Each variation arises because certain conditions are required and to this end each air conditioning plant must be reviewed individually. It can only be repeated that temperature control manufacturers are always willing to advise on any aspects of their controls.

PUMPING STATION

THE Corporation of Limerick have invited tenders for the construction of a sewage pumping station to house 5 No. pumps (not in this contract: 531 lineal feet of 16" C.I. rising main; 880 lineal feet of falling main of various diameters to connect with new sewer in Mulgrave Street in accordance with the plans, specification, bill of quantities, etc., prepared by the City Engineer, Mr. C. Stenson, B.E., M.I.C.E.I., which may be obtained from the City Engineer's Office, Arus Na Cathrach, Limerick, on payment of a deposit of £10, which will be refunded on receipt of a bona fide tender.

Tenders in sealed envelopes, and endorsed "Galvone Pump Station," should reach Mr. T. P. Mac Diarmada, City Manager and Town Clerk, not later than 4 p.m. on Monday, July 24.

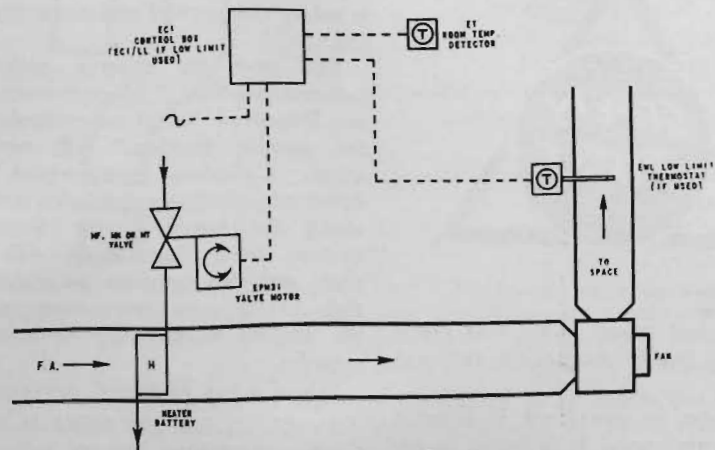
Extended

OFFALY County Council has announced that the date for receipt of tenders in respect of the Rhode Water Supply Scheme (Contractor, last month) has been extended to July 25.

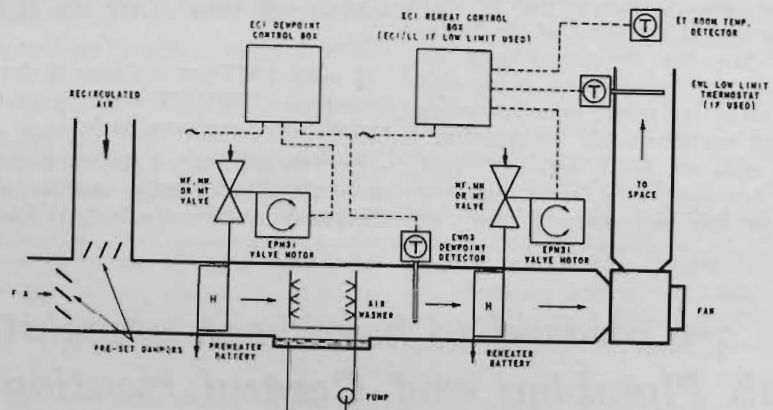
Pamphlet

A new, informative pamphlet on the efficient adjustment of domestic oil burner installations has recently been published by Shandon Scientific Company Ltd., who supply the Bacharach Fyrite Kits and combustion testing.

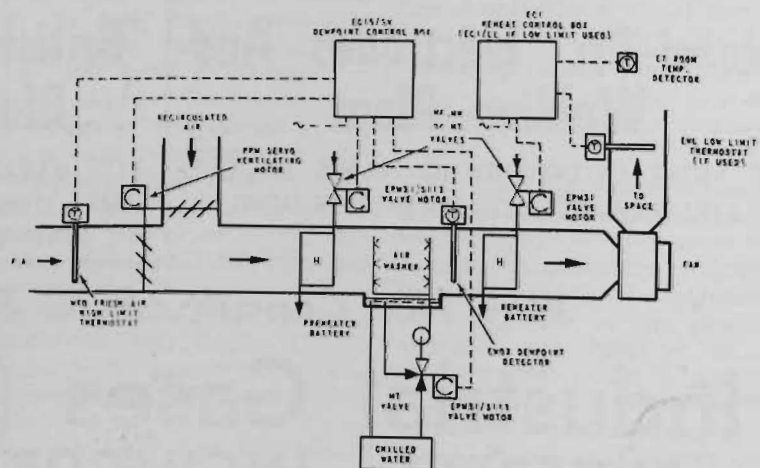
The pamphlet, entitled "How to adjust domestic oil burners for maximum efficiency," is available, free, to all installers from the company's offices, 6 Cromwell Place, London, S.W.7.



Single stage control: warm air heating system (fig. 1).



Single stage constant dewpoint air conditioning system (fig. 2).



Three stage constant dewpoint air conditioning system, with dead zone (fig. 3).



from page twenty-six

of mild steel tubes. All will know just how highly flammable this gas really is.

Acetylene in gas form is instable when compressed. It is liable to explode without warning. Gas as used by the plumber is stored in cylinders painted a distinctive colour. Within these cylinders is a porous mass of cellular material. This is to divide the cylinder space into a myriad of tiny cells so that in the event of the bottle taking fire, the fire-spread will be restricted by progressive movement from cell to cell rather than becoming one vast uncontrollable combustion.

The cells are filled with a liquid called Acetone. This liquid dissolves acetylene gas and when it does so

during the process of cylinder recharging, it is the dissolved acetylene which is safely compressed and not acetylene gas.

The need to observe supplier's recommendation: "Always store and use Dissolved Acetylene cylinders in the upright position," will now be clear. Cylinders used whilst laid down may discharge gas-laden acetone along the hoses to the blowpipe. Serious flame fluctuations will take place and this provides an added fire risk. It is even more dangerous if the acetone should light back to the cylinder.

When using dissolved acetylene:

1.—Check for gas tightness of all joints. Acetylene leakage advertises itself by its strong smell but the leakage source may be difficult to pinpoint. Always proceed to locate the leak with a solution of soft soap painted around each joint. Soap bubbles will blow at the site of the leak.

2.—Do NOT use a flame to detect leakage. FORBID smoking in the vicinity of a suspected leak.

3.—DO NOT allow electric leads to come close to or make contact with Oxygen or Acetylene cylinders. Faulty

cable insulation could cause an electric arc to strike across to the metal cylinders. If this persisted the cylinders would overheat locally and possibly weaken at that point. An acetylene cylinder could take fire from the same cause.

4.—Use hoses of sufficient length to allow cylinders to be well away from sparks or falling slag such as arises from the cutting of mild steel, etc.

5.—Make sure that hoses are soundly jointed at their couplings. Damaged or worn hoses should be cut back to sound hose, or replaced entirely.

6.—Work in a confined space must be adequately ventilated. Always post a "mate" to see that the operative is safe when working in cramped spaces.

7.—If working above ground, take steps to have area below securely cordoned off. Post notice "Danger—Men working overhead."

8.—Always look around and remove or protect flammable materials before starting to work with Oxy-Acetylene equipment.

9.—Always keep firefighting equipment handy whenever the smallest fire risk suggests itself.

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Introducing a new reader service to the CONTRACTOR . . . each month this column will solve some of the everyday problems of the plumbing and heating engineer when our consultants deal with queries directed to "Questions Answered". All queries will be replied to and the most interesting published.

We have experienced drainage troubles through fracture of salt glazed ware pipes in ground subject to movement by subsidence.

Recommendations which might reduce these troubles would be appreciated.

S**A****L****T** glazed ware pipes were developed many years ago to meet a sudden and increasing demand for drainage conduits. The material was easily available and the method of manufacture simple. A drain pipe of high corrosion resistance, smooth bore, easily laid and jointed, the salt glazed ware pipe served its purpose very well indeed.

Apart from the large number of joints in a salt glazed ware drain line (the barred lengths being only 2' 0" per pipe), the low mechanical strength of salt glazed ware is a disadvantage in certain circumstances, particularly where ground movement is likely to be encountered.

Fracture damage of S.G.W. drain lines can be minimised by provision of adequate support for the drain line.

Concrete foundation strips of 4" minimum thickness and 12" wider than the outside diameter of the pipe barrel used in all cases where the trench bottom is not firm, will support the drain and protect it against movement in the vertical plane.

Difference of opinion exists as to whether pipe barrels should lay on the foundation strip or whether the sockets should rest on the strip.

To lay S.G.W. pipes with barrel in full contact with the strip ensures greater continuity of initial support. But this method demands that depressions or "hand holes" be left in the foundation to receive the sockets and to facilitate jointing. A 4" thick foundation strip can be reduced to only 2" thickness at every socket. Clearly, the effective support of the foundation is consequently reduced to

a concrete strip of only 2" thickness, the support value of the strip being equal only to its weakest value.

To lay S.G.W. pipes with sockets in contact on a foundation of continuous thickness (4" minimum), the full support value is utilized throughout. Support for each individual pipe barrel is easily and effectively provided by careful hand tamping of haunching concrete under each barrel after it has been laid, jointed, and tested.

Haunching should be adopted in all cases to resist horizontal deflection of the drain line. The haunching concrete extends from the edges of the foundation strip to half-way up the pipe barrels. Even in stable soils where foundation strips are not necessary, it is a good plan to use haunching. The damage to S.G.W. pipes by lateral deflection due to careless back-filling of trenches is much greater than commonly accepted.

It has long been recommended that drains liable to suffer mechanical damage, either from lack of ground cover, or due to movement in unstable ground, should be of cast iron.

Spun cast iron pipes offer considerably improved resistance to fracture and in the long lengths obtainable the fewer joints needed make for economy and speed of laying.

Soil corrosion or even the corrosive nature of the effluent carried by the drain is a factor worthy of consideration. One or other of these may well suggest that it would be unwise to use cast iron pipe or, if it was, then expensive protective treatments may add to cost.

Pitch Fibre Drain Pipes are light, obtainable in long lengths (5' 6", 8' 0", and 10' 0") and are quickly and easily jointed in any weather condition.

The Pitch Fibre pipe has smooth bore and excellent hydraulic flow characteristics.

It is made from wood pulp formed into a cylinder which is dried and

then impregnated with bitumen. The pipe material is highly corrosion resistant. Furthermore, it has a considerable degree of flexibility.

Flexibility in a drain line stirs a certain amount of controversy. It will be agreed that the function of a drain is to convey wastes speedily and **completely** to a sewer or other approved outfall. A "dip" development in a flexible pipeline destroys that truth of invert which is so essential to the self cleaning and complete emptying requirements of a drain line.

On the other hand, where unstable soils are to conduct a drain line and the smallest ground movement is liable to cause fracture of a brittle pipe material, one is bound to ask: "Is it not better to use a flexible pipeline and risk a possible loss of self cleansing flow action, rather than use a rigid, brittle material which will fracture with dire consequences?"

For economic as well as functional reasons the Pitch Fibre drain pipe is here to stay.

Detailed information—cost, physical properties, jointing and laying, etc.—on this useful form of drain pipe is freely available from the Pitch Fibre Pipe Association of Great Britain, 27 Chancery Lane, London, W.C.2.

Flexible Jointed Salt Glazed Ware pipes are now available to meet the special needs of difficult drainage situations.

The pipes are similar in size to the ordinary S.G.W. pipes but have no joint key grooves on spigot or socket. Accurate cylindricallity of spigot and socket is an essential requirement for successful joint of this pipe. Consequently the rejection of non-standard pipes results in higher production costs and results in flexible jointed S.G.W. pipes being priced at about 50 per cent. above normal rigid jointed pipes.

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WATER SUPPLY AND SEWERAGE SCHEMES: MINISTER'S SURVEY SHOWS PROGRESS



● Mr. Neil
T. Blaney

PROGRESS in regard to water schemes and sanitation was surveyed earlier this month in the Dail by The Minister for Local Government, Mr. N. T. Blaney, moving the vote for his Department.

Work was started in 1960/61 on 95 water supply and sewerage schemes estimated to cost £1,800,000. The aggregate value of such schemes in which loans were sanctioned during that year was £3,100,000, and at April 30 last the gross value of all schemes at the various stages of planning was approaching the £11 million mark.

Controversy had arisen because of the alleged impact on the rates of the water supply drive. It had been suggested that increases varying from 9/- to 15/- in the £ would fall on the rates as a result of the carrying out of a ten-year programme. There was no foundation for these forecasts. The figures of £35 million for the ten-year water supply and sewerage programme and of £30 million for water supplies only were tentative estimates based on the probable cost per house of the number of houses which were likely to be served directly by a sanitary authority.

Rates impact

However, they substantially represented his aim of securing an expenditure on these programmes of about £3 million a year for the ten-year programme. Such figures, however, did not constitute a valid basis for estimating the impact on the rates in any particular area. Such impact would vary from area to area according to the valuation, the extent of the programme and other matters.

In the case of a vital resource such as water, the community must bear a collective responsibility. In the rural areas 84 out of every 100 families had no piped water.

The majority of these were the smaller farmers.

The Minister said that increased exchequer subsidies were now available for the provision of public sanitary conveniences ranging from 40 to 60 per cent. of annual loan charges

and he hoped that sanitary authorities would be thus encouraged to furnish their areas adequately with structures of good design and appearances.

Mr. Blaney said that he would like to see some positive action taken in the immediate future in regard to the development of a programme for the provision of swimming pools and he had directed sanitary authorities to undertake without delay a planned programme for the provision of swimming facilities in urban areas where the demands for piped water and sewerages facilities had been satisfied.

Contributions

Generous financial assistance would

be made available to approved swimming pool projects in form of contributions towards any loan charges incurred. The rate of subsidy, save in exceptional circumstances, would be 50 per cent. Loans from the Local Loans Fund would be available and repayable on the instalment system for periods of up to 30 years.

The same loan facilities and subsidy arrangements would apply to capital contributions made by a sanitary authority to a body providing swimming facilities.

Letters to the Editor

SMALL BORE HEATING

SIR—I have been following the series on small bore heating in the Irish Plumber and Heating Contractor which have been written by Mr. Haig and have found them extremely interesting.

It was with added pleasure that I noticed in Mr. Haig's concluding article in your third issue his comments on the controlling of this type of heating and especially his description of the mixing valve controlled from outside temperatures. This valve is, of course, the one which was developed by the Coal Utilization Research Council and is now manufactured by my Company as our type BMT valve.

A number of these have been installed in this country but we have run up against one snag in the installation of this valve and this is in regard to the motive power necessary to operate the control. Mr. Haig refers to this in his article and rightly says that it is derived from the pressure differential across the pump. In order to obtain correct control, however, it is very essential that the index circuit of the system provides sufficient resistance to give a minimum of 4 feet head loss across the pump and this fact is unfortunately sometimes overlooked.

If you could use your columns to

emphasise this fact I am sure it will help contractors to avoid incorrect installation.

Supplies of explanatory literature are available to your readers on request.

R. E. Ayers,

Manager for Ireland,
The Rheostatic Co. Ltd.,
Graystoke,
Nashville Road,
Howth, Co. Dublin

★ ★ ★

SIR—We have read your article re small bore heating, with interest and should like to point out that in connection with fastening pipes to floors or skirting boards many plumbers and heating engineers in the past have used copper spacing clips, but it has been pointed out to us that if the pipes are not firmly fixed there is a risk of noise transference due to vibration set up by pumping.

We now manufacture a highly finished wall bracket for this class of work, which eliminates the risk of the above mentioned noise transference.

Bolivar Stamping Co. Ltd.

Crown Works,
Parker Street,
Keighley, England.

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The flexible joint is made by placing the rubber sleeved ring provided over the spigot of the special S.G.W. pipe. The beaded end of the sleeve is arranged to coincide with the spigot end. The bead is then rolled back one turn upon its sleeve. In doing so, the thickness of the bead increases by one thickness of the sleeve rubber.

The bead is held in this position whilst the spigot is inserted into the socket. The spigot is then prised home to full socket depth. During this action the rolled bead, which completely filled the joint space between spigot and socket when first introduced, continues to roll back upon itself. As it progressively rolls and thickens a water-tight joint is assured, and the roll forms a fulcrum about which the pipes can pivot or flex in any direction. Total deflections of up to 5 degrees have been tested severely without signs of leakage.



Newcomer to Dravo range

● A new industrial space heater—the Model 30—has been introduced into the Dravo range of heaters marketed by Powell Duffryn Modulair Limited and manufactured by Coventry Radiator and Presswork Co. Ltd.

With an output of 300,000 Btu's/hr. the Model 30 will be the "baby" among Dravo heaters. It is suitable for heating factory bays of up to 80,000 cu. ft. and a wide range of buildings.

The Model 30 is available with either gas or oil firing.

Enquiries direct to Powell Duffryn Modulair Ltd., Vale Road, Camberley, Surrey.



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seeking hot water boiler

SLIGO County Council have invited tenders for the supply and installation of one horizontal hot water boiler (heating output, 1,350,000 B.T.U.) and alterations to the existing central heating system in the County Home, Sligo.

Drawings, Specifications and General Conditions of Contract have been prepared by the Consulting Engineer, Mr. John A. Deasy, and may be inspected at his office, 16, Aran Quay, Dublin, or at the offices of The County Engineer, Courthouse, Sligo.

Copies of the Drawings and Specification may be obtained from The County Engineer, Courthouse, Sligo, on payment of a deposit of three guineas, returnable on receipt of a bona fide tender not subsequently withdrawn.

The Form of Tender and Summary of Tender, both completed in ink, should be enclosed in a sealed envelope endorsed "Tender for Heating Installation, County Home," and this envelope in a sealed cover with all documents should be lodged with the County Secretary, Court-

house, Sligo, not later than 4.30 p.m. on Friday, July 28.

DUBLIN County Council have issued an invitation for tenders for the supply and installation of a rapid gravity filtration plant in accordance with details obtainable from Messrs. N. O'Dwyer, Son & Partners, Consulting Engineers, 6 Burlington Road, Dublin, on the payment of a deposit of £10 10s., returnable on receipt of a bona fide tender not withdrawn.

Latest date for the receipt of tenders in envelope provided is Sept. 3.

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Nitrogen	N	gas
Oxygen	O	gas
Sulphur	S	non-metal (solid or gas)
Tin	Sn	metal
Zinc	Zn	metal

Elements name

THE chemical symbol is the initial letter of the element's name. If

two or more elements have the same initial letter, this is used together with the next, or some other letter in the name. For example, carbon and calcium both begin with "C." In this case carbon is known by the initial "C" and calcium by "Ca."

Sometimes the name of the element is in Latin. For example, lead, copper, and tin have the Latin names plumbum, cuprum, and stannum, and their chemical symbols are Pb, Cu, and Sn, in that order.

Some elements have only one atom in each molecule, in which case a molecule would be indicated simply by the symbol of the element. Others have two or more atoms in each molecule, and then the symbol of the element is followed by a small figure showing how many atoms are present. For example, H_2 and O_2 indicates that one molecule of hydrogen has two atoms of hydrogen, and one molecule of oxygen has two atoms of oxygen.

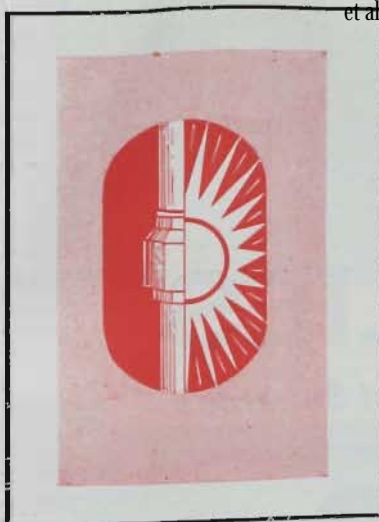
If a figure is placed in front of a chemical symbol it indicates how many molecules are present; thus $2H_2$ is read as two molecules of hydrogen.

★ ★ ★ ★
★ Telephone 908217. ★

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★ Co. Dublin ★
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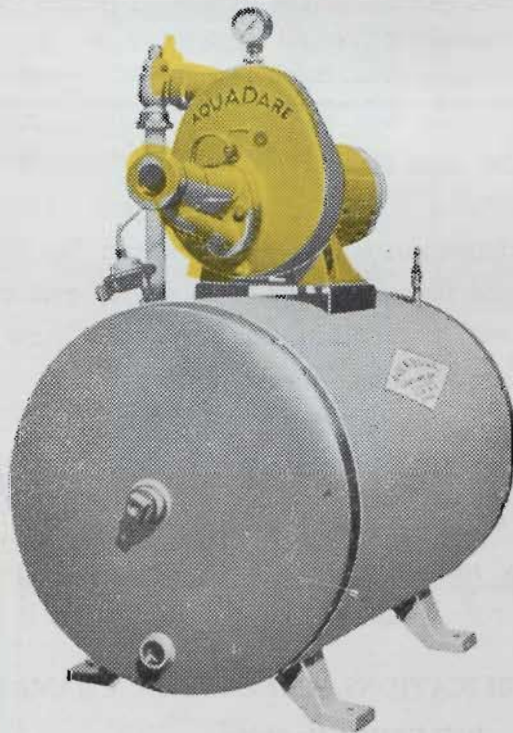
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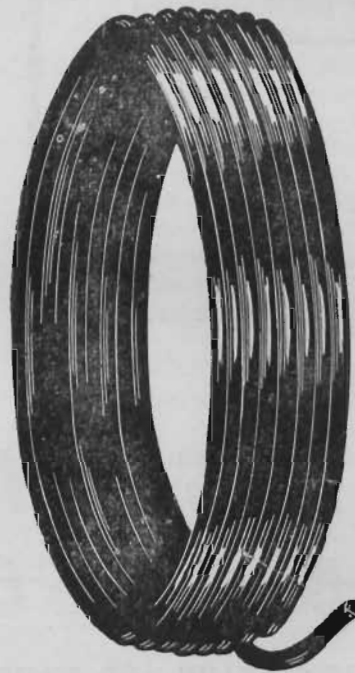
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